
**KING COUNTY CONVEYANCE SYSTEM
IMPROVEMENT PROJECT**

TASK 230

**HIDDEN LAKE SERVICE AREA
CHARACTERIZATION OF EXISTING CONDITIONS**

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INTRODUCTION

This memorandum characterizes the physical and natural environment, known sensitive areas, and basin natural resources of the Hidden Lake Service Area (Service Area). In addition, basin land use and growth impacts are identified. This planning and project identification effort includes a description of geological, biological, and other environmentally sensitive conditions in the Service Area that may affect construction of conveyance systems to extend current service capabilities. This information is summarized in Part 1 below. Relevant data from the City of Shoreline and King County was reviewed and summarized in this memorandum. Potential constraints to implementation of the King County Conveyance System Improvement (CSI) project have been identified.

Current and future land use conditions in the Service Area are summarized in Part 2. Land use constraints that may affect the CSI project are discussed.

PART I. NATURAL ENVIRONMENT

Earth/Geological Features

Topography and Soils: Several relatively steep slopes (in excess of 40 percent) are located within the Service Area. Bluffs are located primarily along the Puget Sound shoreline below the Highlands and Innis Arden neighborhoods. The bluffs diminish east of the Richmond Beach area. The remainder of the Service Area is primarily rolling plateau with a north/south topographic orientation. Elevations within the area range from sea level at Puget Sound to a high of just over 500 feet. Boeing Creek is located in a steeply sloped (greater than 40 percent) ravine.

Soils in the Service Area are predominantly Alderwood series soils (City of Shoreline, 1997). Alderwood soils consist of a gravelly, sandy loam, and tend to have sufficient surface drainage. During winter and spring rains, ponding can occur at the soil surface. Erosion can be severe during heavy precipitation events.

Everett series soils appear on the slopes leading down to Puget Sound and in the area of Boeing Creek. The Everett soils are similar to Alderwood soils (gravelly, sandy loam), except they are typically found below 500 feet in elevation. However, because Everett soils are mostly coarse gravel and sand, they tend to drain rapidly.

Erosion Hazards: Erosion hazards are significant within parts of the Service Area, especially along the bluffs of Puget Sound and the steep ravines of Boeing Creek (see Figure 1). The susceptibility of any soil type to erosion depends upon the physical and chemical characteristics of the soil, its vegetative cover, slope length and gradient, intensity of rainfall, and the velocity of water runoff. Significant erosion in the Service Area is most likely to occur along the Boeing Creek ravine and the hillsides in the Richmond Beach area.

Activities associated with clearing, grading, and construction can potentially contribute to erosion and sedimentation potential. Implementation of proper erosion and sedimentation control measures during construction should be used to minimize construction impacts. Following any construction activity, the site should be stabilized and re-vegetated, and drainage systems put in place to further minimize any long-term erosion and sedimentation and sedimentation impacts.

Landslide Hazards: Landslide hazard areas are defined as areas with a combination of greater than 15 percent slopes, impermeable soils, and ground water seepage. Areas with a history of rapid stream incision, stream bank erosion, or undercutting by wave action, as well as areas with a geological history that would indicate landslide susceptibility are also designated as landslide hazard areas. Within the Service Area, these areas include the bluffs along Puget Sound and the Boeing Creek ravine (see Figure 1).

Parts of the Service Area have experienced landslide problems due to water-saturated soils and excessive storm water discharge. In December 1996, a series of heavy snowstorms and rainstorms saturated soils in some parts of the City of Shoreline, causing soil erosion and sloughing. The most significant sloughing of soils occurred in and around Shoreview Park. In the aftermath of this storm, several streets throughout the City suffered severe surface cracking and undercutting beneath the asphalt as soils eroded from the heavy runoff. These events indicate the potential geologic hazards in the area that might occur from soil saturation and storm water runoff. All work in Landslide hazard areas within King County shall comply with the King County Sensitive Areas Ordinance.

Seismic Hazards: Seismic hazard areas are subject to severe risk of earthquake damage because of settlement or soil liquefaction. These conditions occur in areas underlain by soils with low cohesion and density, and are usually associated with a shallow ground water table. When shaken by an earthquake, these soils can lose their ability to support loads. Loss of soil strength can also result in failure of the ground surface and damage to or collapse of structures supported in or on the soil. Loose, water-saturated materials are the most susceptible to ground failure due to earthquakes.

The King County Sensitive Areas Map Folio (King County, 1990) identified one area within the Service Area that has the potential for seismic hazard (see Figure 1). This area is located along the Puget Sound shore in Richmond Beach Saltwater Park. Within this area, structures would be vulnerable to seismic impacts due to ground shaking and ground failure. All work in Seismic hazard areas identified on the King County Sensitive Areas Map Folio shall comply with the King County Sensitive Areas Ordinance.

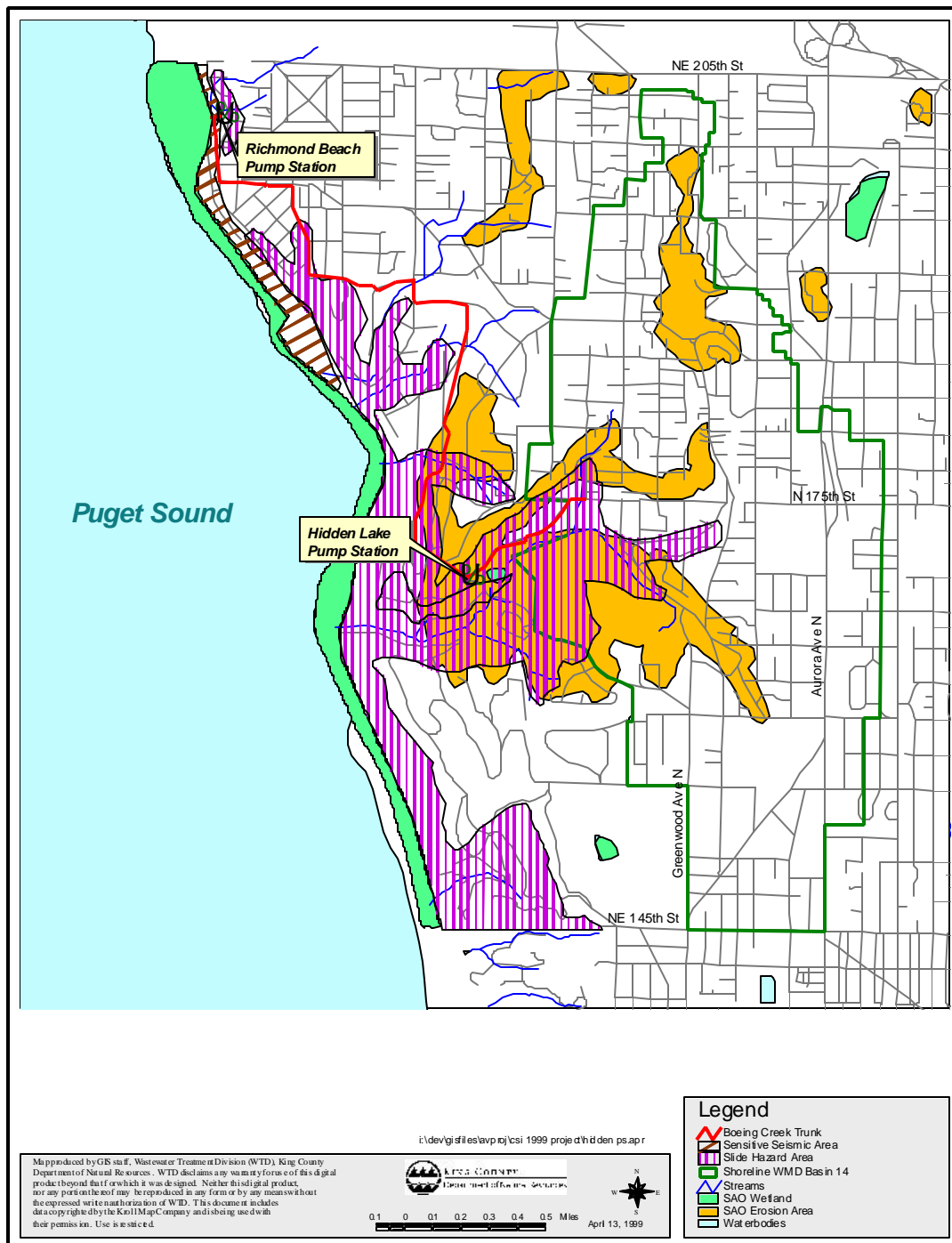


Figure 1. Geological features and environmentally sensitive areas. Sewage collected in Shoreline WMD Basin 14 and areas to the west drain to the Richmond Beach PS.

Hazardous Materials: Based upon documentary information (e.g., King County records) there is no evidence of significant quantities of hazardous materials within the Service Area. Some businesses in the Service Area, such as service stations, manufacturers, paint supply stores, etc., likely use and store hazardous materials. Because the majority of the Service Area is residential, the likelihood of encountering hazardous materials is small, except in those areas identified above.

Significant Vegetation

The City of Shoreline has identified significant areas of primary and secondary types of vegetation within the Service Area. Primary areas are areas of vegetation with little or no development that tend to occur in ravines, steep slopes, native growth easements, natural reserves, and parks. More widespread areas of secondary vegetation cover residential areas and large lots, with interspersed large tree stands. Existing mature vegetation is an important characteristic of the Richmond Beach/Innis Arden area.

Significant areas of vegetation exist at Boeing Creek Park and adjoining Shoreview Park. Boeing Creek Park is listed as a Natural Open Space Area, and Shoreview Park is designated as a Large Urban Park (City of Shoreline, 1998a). Boeing Creek Park is predominantly forested, with the majority of the site being a coniferous forest (City of Shoreline, 1999). The coniferous forest provides habitat for a variety of bird, mammal, amphibian, and reptile species.

Water Features

Surface Water Basins: The Service Area is located within four surface water drainage basins (see Figure 2). These basins include the Boeing Creek Basin, two portions of the Middle Puget Sound Basin (North and South), and a small portion of the West Lake Washington Basins. With the exception of the West Lake Washington Basin, the natural drainage of the majority of the Service Area is to Puget Sound.

The Boeing Creek Basin is the only basin contained entirely within the City of Shoreline, and encompasses approximately 1,575 acres (City of Shoreline, 1997) and its boundaries roughly correspond to those of Shoreline Wastewater Management District (WMD) Basin 14. The basin is approximately 90 percent developed (refer to the land use section below).

The Boeing Creek and two Middle Puget Sound drainage basins are characterized by steep incising channels that have suffered moderate to severe erosion of the channel beds and banks, especially in the lower reaches near Puget Sound. This is typical of areas that were developed prior to the institution of drainage control systems and of areas characterized by steep topography. King County has constructed several drainage detention systems in the Boeing Creek Basin, including a detention pond in Boeing Creek Park near NW 175th Street. Many areas in these basins, particularly along 3rd Avenue NW, flood regularly. The winter storm of 1996 significantly affected these drainage basins. In the Boeing Creek Basin, Hidden Lake filled with sediment and is currently

being reconstructed. Hidden Lake sediment removal work was completed in 1997. Road embankments failed at NW 175th Street and 6th Avenue NW, pavement cracked along Carlyle Hall Road, drains were clogged, and the foundations of homes were undermined during this storm.

Streams and Creeks: The streams within the Service Area are illustrated on Figure 2. The King County Sensitive Areas Map Folio (1990) lists all of the streams as unclassified. Unclassified streams are those for which a watercourse has been identified but defining characteristics have not been determined. Further study would have to be done to classify these streams. Boeing Creek is included as an unclassified stream according to the King County Map Folio. In addition, several localized seeps have been identified in the Boeing Creek corridor (City of Shoreline, 1999). These seeps indicate a discharging shallow ground water system in this area.

A fish passage project on Boeing Creek was completed in 1998. All work within the stream or stream buffer shall comply with the King County Sensitive Areas Ordinance. All work within the stream or below the ordinary high water mark shall be authorized by the Washington State Department of Fish and Wildlife through the issuance of a Hydraulic Project Approval.

Shoreline: The King County Map Folio (1990) lists the entire Puget Sound shoreline within the Service Area as Class 1. The Class 1 designation indicates that the waterway is listed and inventoried as a “Shoreline of the State” under the King County Shoreline Master Program, and has a 100-foot buffer requirement. The City of Shoreline Comprehensive Plan (1997) designates the shoreline area into three categories: Urban Shoreline, Rural Shoreline, and Conservancy Shoreline (refer to Figure 2). The purpose of the Urban Shoreline designation is to “ensure optimum utilization of the shorelines of the state within urbanized areas by permitting intensive use and by managing development so that it enhances and maintains the shoreline for a multiplicity of urban uses”. The purpose of the Rural Shoreline designation is to “restrict intensive development, function as a buffer between urban area, and maintain open spaces and opportunities for recreational uses.” Conservancy Shoreline areas are intended to “maintain their existing character.” All work within the “Shoreline of the State” shall require a Shoreline Master Use Permit from the King County Department of Development and Environmental Services. All work within the Shorelines of the State and below the ordinary high water mark shall require a section 404 permit from the Army Corps of Engineers.

Puget Sound is also considered a “shoreline of statewide significance,” as designated by the Shoreline Management Act (RCW 90.58). Alteration of a shoreline of statewide significance can be difficult, and must be consistent with the Shoreline Master Plan. The City’s Puget Sound shoreline has a variety of conditions. In the northern Richmond Beach section, the shoreline has an urban character. Development includes the Point Wells oil tank farm and asphalt plant, Burlington Northern Tracks and rip-rap at the water’s edge, a wastewater pumping station, and dense single-family housing on the waterfront. Community discussions reveal that adequate public access may be lacking, although some community members believe that public access should be restricted to the Richmond Beach Saltwater Park.



Figure 2. Surface water features of the Service Area.

The middle section of the shoreline has the Burlington Northern tracks and rip-rap at the water's edge, single-family housing upland of the tracks, and Richmond Beach Saltwater Park. The bluff above the railroad tracks begins to rise south of the park.

In the southern half of the shoreline, along the Innis Arden and Highlands neighborhoods, the Burlington Northern tracks and rip rap is at the water's edge without public access. The bluff rises above the tracks, becomes wooded, and is undeveloped.

Flood Hazard Areas: Approximately 37 acres of the Service Area within the Boeing Creek watershed are considered a flood hazard area, corresponding to the 100-year floodplain as delineated and mapped by the Federal Emergency Management Agency (FEMA). The flood hazard area is located along the creek channel from Shoreview Park downstream to Puget Sound (see Figure 2). The 100-year floodplain is an area that has a one percent probability of inundation in any given year. All work within the flood hazard area shall comply with the King County Sensitive Areas Ordinance. Modifications which result in appreciable rise in the 100-year flood elevation will require permission from affected property owners and require a revision to the FEMA flood insurance rate maps.

Wetlands: Wetlands are unique environments comprised of diverse terrestrial and semi-aquatic habitats. Biological habitat support refers to a wetland's provision of nesting, breeding, rearing, and feeding habitat for aquatic and terrestrial wildlife species. Wetland systems within the Service Area offer pockets of habitat for urban wildlife and wetland-dependent plant and animal species. A wetland's size, water quality, diversity of habitat, and habitat structure affect performance and function. All work within wetlands or their buffers are subject to the King County Sensitive Areas Ordinance. Work within wetlands adjacent to Shorelines of the State requires the approval of the Army Corps of Engineers through an Individual Permit.

A review of the background information, including the King County Map Folio and the City of Shoreline Comprehensive Plan, identified two wetlands within the Service Area (see Figure 2). These wetlands are a 253-acre estuarine system (a mixture of salt and fresh waters) adjacent to Puget Sound and a 1.5-acre wetland adjacent to Hidden Lake.

The estuarine wetland along shoreline in the Service Area (refer to Figure 2) is a class 1 wetland with a 100-foot buffer. The low level of urban development along the Puget Sound shoreline indicates that this is the least disturbed and highest quality wetland within the City. This wetland is noted as providing a high degree of storm and flood water storage, providing a high degree of water quality improvement, and having high support for biological habitat. The overall rating of this wetland system is high (City of Shoreline, 1997).

The Hidden Lake wetland, including the lake, is noted as providing moderate storm and flood water storage, moderate water quality improvement, having moderate ground water exchange, and providing moderate biological habitat support. The overall rating for this wetland is moderate.

The identified (documented) wetlands have a minimum size threshold of about one-half acre (i.e., wetlands under one-half acre may exist but were not identified on either the King County Inventory or U.S. Fish and Wildlife Services National Wetland Inventory). Numerous smaller wetlands may exist throughout the Service Area. While individually these areas may be small, their cumulative value to provide wildlife habitat, storm water and floodwater storage and alteration, and groundwater exchange should not be overlooked. These areas may range from regularly mowed, low, wet areas in backyards and parks to relatively undisturbed steep areas along the banks of Boeing Creek and the smaller unclassified streams.

Summary

The potentially most significant natural environment constraints to the CSI project would be construction along the Boeing Creek corridor, along the Puget Sound Shoreline, and the along the bluffs near Richmond Beach/Innis Arden. The Boeing Creek corridor has steep, unstable slopes; seeps; and forested, mature vegetation which may place significant constraints on construction activities. Construction along Puget Sound could involve significant permitting and mitigation for shoreline and estuarine wetland disturbance. Construction through the bluffs represents challenges related to unstable slopes and potentially significant erosion hazards. These challenges will need to be addressed during the study and design of any projects in the area. Alterations to areas with large stands of trees should also be avoided as much as possible.

PART II. LAND USE AND GROWTH IMPACTS

The potential changes in land use practices and their effects on wastewater conveyance needs within the Service Area are described in this section. This assessment is based upon forecasted changes in the population and the distribution of residential, commercial and industrial development in the Service Area, as well as the identified conveyance system facilities and capacity issues (discussed in Task 210 and Task 220 memoranda).

The City of Shoreline recently adopted a comprehensive plan (City of Shoreline, 1998b) to guide social and economic development over the next 20 years. The plan calls for an additional 2,651 residential units to be built in the city through a combination of single-family, multi-family and mixed use development (Table 1). The Hidden Lake Service Area is expected to absorb a substantial portion of the new development.

Table 1. City of Shoreline Comprehensive Plan

	Land Use (acres)		No. of New Units
Residential Single Family:	3,777	(60%)	1,073
Medium Density ^a :	103	(1.6%)	123
Multi-family:	278	(4.3%)	1,228
Mixed Use ^b :	132	(2.1%)	227
Subtotal Residential:	4,290	(68%)	2,651
Commercial:	297	(4.7%)	N/A
Public Facilities:	698	(11.1%)	N/A
Open Space:	658	(10.5%)	N/A
Other	341	(5.7%)	N/A
Total Acres:	6,284	(100%)	N/A

a. Duplexes and triplexes are examples of medium density housing.

b. Mixed use housing may include a combination of single family, medium density, multi-family and light industrial land use.

The Hidden Lake Service Area is primarily composed of single family residences with minimum lot sizes of 7,200 or 15,000 square feet. There is also a clustering of commercial development along Aurora Avenue and higher density housing on Richmond Beach Drive. The proportion of higher density housing in the Service Area is expected to increase over the next 20 years. The new higher density residential and commercial development will be concentrated along and adjacent to Aurora Avenue, Richmond Beach Drive, and possibly at Point Wells.

Developing vacant lots in established neighborhoods and subdividing private property is how the 1,073 new single family units will be accommodated. Availability and economics will determine the location of these new single family units. It is not known what fraction of the development will occur within the Service Area.

Aurora Avenue: The comprehensive plan calls for redevelopment of the existing Aurora Avenue commercial corridor with the goal of transforming the section between N 175th and N 185th Streets into a city center, distinct from other sections of Aurora Avenue. These redevelopment plans include constructing additional housing, promoting larger floor-area-ratio retail units, and greater accessibility for pedestrians. The new housing will be a combination of medium density, multi-family and mixed use. Multi-family units will not exceed 6 stories in height. This section of Aurora Avenue is part of Shoreline WMD basin 14, which drains by gravity to the Hidden Lake Pump Station.

Richmond Beach Drive: New multi-family residential mixed-use construction would occur in an area that is already zoned for multi-family use. Shoreline WMD sewers along Richmond Beach Drive drain to a previously sliplined gravity section of the Boeing Creek Trunk along Ridgefield Road NW and 15th Avenue NW.

Point Wells: The former Chevron plant at Point Wells (north of the Richmond Beach Pump Station) was identified as a possible annexation site in the comprehensive plan. Potential

redevelopment scenarios include the construction of a marina, hotel, parkland and office space while allowing some light-industrial activities to continue. It has also been mentioned as a representative marine site for a future regional wastewater treatment or reclamation plant. Shoreline Pump Station No. 13 is located on the site. It pumps wastewater southward along Richmond Beach Drive to MH B00-4, upstream of the Richmond Beach Pump Station. Shoreline Pump Station No. 13 is only a few years old, and at the time of its construction it was oversized (450 gpm @ 50 ft TDH), to accommodate future development of this area.

Persistent capacity issues at the Hidden Lake Pump Station and in the downstream conveyance system were described in the Task 210 memo. Additional wastewater generation in the Service Area will further strain on the KC WTD sewer system during the wet weather season. In response to the comprehensive plan, the Shoreline WMD is in the process of updating their comprehensive sewer plan and expects to have it completed by September of 1999. According to Shoreline WMD staff, there is sufficient capacity in their collection system to accommodate some increases in wastewater generation.

REFERENCES

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